UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON D.C., 20460

OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

MEMORANDUM

SUBJECT: BEAD Characterization of Sugar Beet Planting Practices in Support of the Human Health Risk Assessment for Aldicarb (PC: 098301)

FROM: Jonathan Becker, Senior Science Advisor
Clayton Myers, Senior Entomologist
Biological and Economic Analysis Division (7503P)

THRU: Monisha Kaul, Chief
Biological Analysis Branch

TO: Susan Bartow, Chemical Review Manager
Risk Management and Implementation Branch IV
Pesticide Re-evaluation Division (7508P)

Michael Metzger, Chief
Risk Assessment Branch 7
Health Effects Division (7509P)

PRODUCT REVIEW PANEL: October 4, 2017

SUMMARY

EPA's Office of Pesticide Programs (OPP) has initiated the re-evaluation of the insecticide/nematicide aldicarb (PC: 098301) under the registration review program. As part of registration review, OPP's Health Effects Division (HED) is assessing occupational risks from exposure to aldicarb. Potential risk concerns have been identified for mixers/loaders/handlers who would be loading application equipment with granular aldicarb products for use at-planting on sugar beets.

BEAD is providing information to HED to help refine exposure estimates. HED's default acres treated per day values reflects a worker planting 200 acres of sugar beets during an 8-hour workday. BEAD determined the maximum likely area that could be treated in one day, along with an estimate on the typical number of re-fills necessary for the same work day. Depending on the planting equipment used, 50 acres (12-row planter) to 105 acres (24-row planter) of sugar beets could be planted per 8-hour workday. Assuming currently available granular insecticide hoppers are used, at least two refilling events would be required in an 8-hour workday, with approximately 4 hours elapsing between these events.

INTRODUCTION/PURPOSE

FIFRA Section 3(g) mandates that EPA periodically review the registrations of all pesticides to ensure that they do not pose unreasonable adverse effects to human health and the environment. This periodic review is necessary in light of scientific advancements, changes in policy, and changes in use patterns that may alter the conditions underpinning previous registration decisions. In determining whether effects are unreasonable, FIFRA requires that the Agency consider the risks and benefits of any use of the pesticide.

OPP is assessing aldicarb for both human health and ecological exposures and risk. Aldicarb is an N-methyl-carbamate insecticide/nematicide that is registered for at-planting applications on many agronomic crops. OPP's Health Effects Division (HED) is assessing occupational uses of aldicarb and has identified potential acute risk concerns for mixers and loaders preparing seeding equipment for the planting of sugar beets. There are no concerns for mixers/loaders for any other crop scenarios besides sugar beets. HED's exposure estimates for mixer/loaders of pesticides (applied at planting for seeded row crop uses such as sugar beets) are driven by an assumption of a worker planting 200 acres per workday. For occupational exposure and risk assessments, a workday is considered to be 8-hours long.

Because aldicarb is an N-methyl-carbamate, cholinesterase inhibition caused by binding to acetylcholinesterase receptors in humans is reversible, and effects degrade relatively quickly after exposure. This means that short-duration exposures and acute effects are the main risk driver for humans, rather than chronic effects from longer-term exposures to smaller doses.

HED's risk assessment assumes that a mixer/loader of aldicarb would be exposed to one single 'bolus' dose of aldicarb at the time of loading planting equipment. This exposure assumption may cause an over-estimate of risk concerns if the actual exposure is split into multiple smaller events over time. To refine the assessment, BEAD is providing estimates of the upper-bound sugar beet area planted per 8-hour workday and the frequency that the granular insecticide hoppers on a sugar beet planter would be re-filled with aldicarb.

ACRES OF SUGAR BEETS PLANTED PER 8-HOUR DAY

Sugar beets are usually grown in 22 inch rows (Khan et al. 2016). Twelve row planters are commonly used (Patterson 2015a, 2015b), but a 24-row planter is also available (DB44 row planter, Deere and Co 2017).

There are two methods of calculating the number of crop acres planted per 8-hour day. The first method is to convert custom machine and labor time per acre to acres per period of time. The data for the calculation comes from sugarbeet crop budgets. These values can be used directly as they are measures of the actual work rate. BEAD identified three sources of custom work rates. Patterson (2015a, 2015b) reports work rates of 0.16 and 0.19 hours per acre for a 12-row planter with a 22-inch row. This equates to 5.3 to 6.25 acres planted per hour, or 42 to 50 acres planted per 8-hour day. Stein (2016) reports a work rate of 4.6 acres of sugar beets planted per hour using a 12-row planter, or 37 acres per 8-hour work day.

An alternative approach is to calculate the number of crop acres that could be planted based on average field speeds, field efficiencies, and effective field capacities of the planting equipment. Theoretical field capacity of agricultural equipment is the calculated rate at which it performs its primary function and is based on the full width of the machine and average travel speed (swath width * speed). It is usually expressed in acres per hour of operation. Effective field capacity is always less than this due to events that slow the tractor speeds (e.g., making turns) or stopping the equipment (e.g., refilling planter, maintenance). The ratio of the actual field capacity to the theoretical field capacity is termed the field efficiency.

Field efficiency accounts for time delays and failure to use the full operating width of the machine. Some of these delays include turning, filling the planter with seed or pesticides, cleaning and adjusting the planter, and operator rest stops. Although wider equipment operated at the same speed obviously covers more acres per hour, the field efficiency is slightly lower because more time and space is required to turn the equipment in headlands. To estimate the acres planted per hour (or actual field capacity) for a 24-row planter, the following equation is used:

*Effective field capacity (Acres / hour) = swath width * speed * field efficiency * unit conversions*

Where: Width = 22-inch row * 24 rows * 1 ft / 12 inches = 44 feet
Speed = 4 miles per hour (Khan et al. 2016)
Field Efficiency = 62 percent (Hanna 2016)
Unit conversions = 5,280 feet per mile; 43,560 square feet per acre.

The resulting estimate for a 24-row planter planting 22 inch rows is 13.2 acres per hour or 105 acres per 8-hour workday.

NUMBER OF RELOADING EVENTS PER DAY

Planters have separate granular insecticide hoppers for each row, each with a 70-pound capacity for granular pesticides (Deere and Co. 2017). A fully loaded 24-row planter would hold 1,680 pounds (24 rows * 70 lbs per hopper) of granular insecticide product and a fully loaded 12-row planter would hold 840 pounds (12 * 70 lbs). Assuming the maximum aldicarb label rate of 33 pounds of product per acre (EPA Reg. No. 264-330) the 12-row planter would have to be refilled after planting 25 acres (840 lbs / 33 lbs per acre), resulting in 2 fill events to treat 50 acres in a single work day. The 24-row planter would have to refilled after planting 51 acres (1680 lbs / 33 lbs per acre), resulting in at least two granular insecticide hopper filling events in a workday, and with approximately 4 hours elapsing between these events.

CONCLUSIONS

Exposure to aldicarb for mixers/loaders of application equipment for use at-planting on sugar beets is likely over-estimated using HED's default assumptions for row crops. Depending on the planting equipment used, 50 acres (12-row planter) to 105 acres (24-row planter) of sugar beets could be planted per 8-hour day. Assuming currently available granular insecticide hoppers are used, at least two refilling events would be required in an 8-hour workday, with approximately 4 hours elapsing between these events.

REFERENCES

Deere and Co. 2017. Planter brochure. Available at: [HYPERLINK "http://crossimplement.com/upload/files/resources/john_deere_literature_rack/John%20Deere%20Planter%20Literature.pdf"]. Accessed October 4, 2017.

Hanna, M. 2016. Power and Machinery. Capacity. Extension Engineering Handbook. The University of Georgia College of Agricultural and Environmental Sciences. Available at: [HYPERLINK "http://caes2.caes.uga.edu/engineering/handbook/documents/capacity.pdf"]. Accessed October 4, 2017.

Khan, M., D. Franzen, M. Boetel, A. Chanda, A. Sims, and T. Peters. 2016. 2017 Sugarbeet Production Guide - A1698. North Dakota State University / University of Minnesota Extension. Available at [HYPERLINK "https://www.ag.ndsu.edu/publications/landing-pages/crops/sugarbeet-production-guide-a-1698"]. Accessed October 4, 2017.

Patterson, P.E. 2015a. Round Ready Sugar Beets, Southcentral Idaho. EBB3-Su-15 2015 Costs and Returns Southcentral Idaho: Magic Valley Estimate. University of Idaho Extension. Available at: [HYPERLINK "https://www.uidaho.edu/cals/idaho-agbiz/crop-budgets"]. Accessed October 4, 2017.

Patterson, P.E. 2015b. Round Ready Sugar Beets, Eastern Idaho: Bingham and Power Counties. EBB4-Su-15 2015 Costs and Returns: Eastern Idaho. University of Idaho Extension. Available at: [HYPERLINK "https://www.uidaho.edu/cals/idaho-agbiz/crop-budgets"]. Accessed October 4, 2017.

Stein, D. 2016. 2017 Custom Machine and Work Rate Estimates. FIRM Team Fact Sheet Number 16-3, Michigan State University Extension. Available at: [HYPERLINK "https://msu.edu/user/steind/cp-17%20MASTER%20Cust_MachineWrk%20NOV%2009%202016.pdf"]. Accessed October 4, 2017.